Work Plan

Alternative Landfill Cover Design

Introduction

In an October 12, 2012 letter, EPA Region 7 asked that, as part of a Supplement to the Supplemental Feasibility Study [SFS] (EMSI, 2011), the Respondents evaluate potential alternative landfill cover designs including but not limited to an Evapo-Transpiration (ET) Cover for Operable Unit-1 (OU-1) of the West Lake Landfill. EPA had previously indicated that the National Remedy Review Board wanted the use of synthetic cover materials evaluated as part of the Supplemental SFS. During a September 24, 2013 meeting to discuss EPA and MDNR comments on the various additional SFS evaluation work plans, EPA indicated that an ET cover was not applicable to OU-1. Therefore, this work plan presents a scope of work for evaluation of the potential application of an alternative cover that would incorporate a synthetic material layer, specifically a geosynthetic clay liner (GCL), into the design of the landfill cover for OU-1. The alternative landfill cover evaluation is focused on possible use of a GCL because a GCL contains natural clay material sandwiched between geotextile fabric. Use of natural materials is preferred due to the overall longevity of natural materials as compared to man-made materials.

Background

ROD-Selected Remedy Landfill Cover

The remedy selected in EPA's Record of Decision (ROD) for OU-1 (the ROD-selected remedy) includes an enhanced Resource Conservation and Recovery Act (RCRA) Subtitle D (solid waste) cover system to be installed and maintained over Radiological Areas 1 and 2 (EPA, 2008). This cover system would at a minimum be designed to meet the design requirements for final cover systems at municipal solid waste landfills (MSWLF) and the Missouri closure and post-closure requirements for sanitary landfills, with additional enhancements consistent with standards for uranium mill tailings sites (i.e., armoring layer, protection against gamma radiation, and radon barrier). Specifically, the design of the landfill cover under the ROD-selected remedy is anticipated to consist of the following layers (from top to bottom):

- A one-foot thick layer of soil capable of sustaining vegetative growth;
- A two-foot thick infiltration layer of compacted USCS CL, CH, ML, MH, or SC soil-type with a coefficient of permeability of 1×10^{-5} cm/sec or less; and
- A two foot thick bio-intrusion/marker layer consisting of well-graded rock or concrete/asphaltic concrete rubble.

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Such a cover system includes a low conductivity barrier layer, in this case the two foot thick infiltration layer described above, to minimize percolation of rainfall or snowmelt through the cover from entering the underlying waste materials.

Landfill Cover Incorporating a Geosynthetic Layer

There are several types of geosynthetic products that are often used in landfill containment design that could be considered for alternate landfill cover designs to the soil-only landfill cover prescribed in the ROD remedy. For example, geomembranes or GCLs are often used as low-permeability components, and geonets and geotextiles are often used as drainage layers. For this evaluation, the use of a GCL will be evaluated A GCL is a synthetic product composed of a core layer of natural low-permeability bentonite clay sandwiched between geotextile fabric. With its low permeability, a GCL may have the potential to be used as a substitute for all or part of the infiltration layer, and still achieve the objective of minimizing percolation through the cover. Selection of a GCL as the representative process option for the evaluation of an alternative cover using synthetic materials was based on the reliance of GCL on the presence of bentonitic clay for achieving low permeability. Being a natural material, bentonite is expected to offer significant advantages over plastic-only based geomembranes in terms of longevity and durability.

Approach

The potential implementability of an alternative landfill cover design for Areas 1 and 2 will be evaluated in the same manner that the potential applicability of other technologies are evaluated in the SFS. Specifically, an initial technical implementability screening evaluation will be performed to assess the potential applicability of the alternative landfill cover design. If the initial screening indicates that the alternative landfill cover design is potentially applicable to OU-1, this technology would then be subjected to further evaluation of its potential effectiveness, implementability and cost. During this phase, the anticipated performance of the alternative landfill cover design would be compared to that of the cover specified in the ROD-selected remedy. If these evaluations indicate that the alternative landfill cover design could provide similar effectiveness at minimizing infiltration at comparable cost, then a recommendation for consideration of use of an alternative landfill cover design would be made.

Geosynthetic Clay Liner Cover Design

An initial technical screening will be performed to assess the potential implementability of an alternative landfill cover design that incorporates a GCL liner into the landfill cover design specified under the ROD-Selected Remedy (hereafter referred to as the "GCL-alternate cover"). Because use of GCLs in cover systems is a generally accepted technology for landfills, the primary focus of this evaluation will be the anticipated design life of a GCL layer relative to the longevity criteria that have previously been identified as potentially relevant and appropriate requirements under the Uranium Mill Tailings

Radiation Control Act regulations for the landfill cover. The initial implementability screening evaluation will also consider site-specific factors that could affect the implementability of a GCL-alternate cover. Specifically, the potential effects of a GCL-alternate cover on the overall stability of the final landfill slopes will be evaluated. In addition, the need for inclusion of additional soil material to allow for installation and incorporation of a GCL in the landfill cover and the resultant approximate impacts on the extent and volume of waste material that would need to be regraded will be considered. Finally, other installation and maintenance issues that may arise will be addressed.

If the initial technology screening evaluation indicates that a GCL-alternate cover is considered potentially implementable, this technology will be subjected to evaluation of its potential effectiveness, implementability and cost. During this phase, the anticipated performance of a GCL-alternate cover would be qualitatively compared to that of the cover specified in the ROD-selected remedy. If these evaluations indicate that a GCL-alternate cover could provide similar effectiveness to the ROD-selected remedy at minimizing infiltration at comparable cost without significant adverse impacts, then a recommendation for consideration of incorporation of a GCL-alternate landfill cover instead of the cover specified in the ROD would be made.

Deliverables

1. Interim Deliverable – A brief memorandum will be prepared summarizing the results of the initial screening of the potential implementability of a GCL-alternate cover for OU-1. If a GCL alternate cover is considered potentially implementable, this memorandum would also include an evaluation of the potential effectiveness, implementability and cost of these covers. If the results of these evaluations indicate that a GCL-alternate cover could provide comparable performance at a comparable cost to that of the low permeability cover included in the ROD-selected remedy, a recommendation for development and evaluation of use of an alternative cover design consisting of a GCL-alternate cover as an alternative to the ROD-selected remedy cover system would also be included in this memorandum.

2. SFS revisions – Assuming that the evaluation of a GCL alternate cover technology only entails evaluation of the potential applicability of this technology and does not result in development of new/additional remedial alternatives, the following revisions to the SFS report are anticipated:

    a Section 4 – Technology Screening to include evaluation of GCL cover technology implementability
        i. Section 4.2 – Identify a GCL-alternate cover as an additional technology/process option to be evaluated in the SFS
        ii. Section 4.3 – Include a description of a GCL-alternate cover technology
        iii. Section 4.4 – either
            1. Identify a GCL-alternate cover technology as a technology that was screened out based on implementability factors, or

2. Evaluate the implementability of a GCL-alternate cover technology

iv. Figure 24 – Add evaluation of the technical implementability of a GCL-alternate cover technology to this figure.

v. Figure 27 – Add evaluation of the anticipated effectiveness, implementability and cost of a GCL-alternate cover technology.

In the event that the GCL-alternate cover technology is found to be potentially applicable based on the site and waste conditions, there may be a need to develop one or more additional remedial alternatives for detailed analysis in the Supplemental SFS report. Such an effort is not included with the scope of the evaluation of an alternative landfill cover design addressed by this Scope of Work.

Schedule

It is anticipated that performance of an initial technology screening of the potential implementability of a GCL-alternate cover technology for OU-1 will take approximately four weeks from receipt of EPA approval of this Work Plan. Assuming that a GCL-alternate cover technology is potentially implementable for OU-1, the technical evaluation of the potential effectiveness, implementability, and cost of such alternative landfill cover design and preparation of a summary memorandum will take approximately another four weeks time.

Preparation of a Supplemental SFS report that includes the results of the evaluations of a GCL-alternate cover technology will be performed once EPA comments on the interim deliverable are received and in conjunction with revisions to the existing SFS report required to address the results of the various other additional tasks EPA has requested.

References Consulted

Carson, David, undated, Geosynthetic Clay Liners in Waste Containment, EPA Office of Research and Development, National Risk Management Research Laboratory.

Engineering Management Support, Inc. (EMSI), 2011, Supplemental Feasibility Study, Radiologically-Impacted Material Excavation Alternative Analysis, West Lake Landfill Operable Unit-1, December 16.

Gagne, Dennis, P. 2001, Technical Memorandum to Office of Site Remediation and Restoration – Revised Alternative CAP Design Guidance Proposed for Unlined, Hazardous Waste Landfills in the EPA Region I, February 5.

Row, R.K , and Rimal, S. 2008, Ageing and Long-term Performance of Geomembrane Liners, The First Pan American Geosynthetics Conference & Exhibition, March 2 - 5.

EPA, 2008, Record of Decision – West Lake Landfill Site, Bridgeton Missouri, Operable Unit 1, May.

EPA, 2004, (Draft) Technical Guidance for RCRA/CERCLA Final Covers, EPA 540-R-04-007, April.

EPA, 2002, Assessment and Recommendations for Improving the Performance of Waste Containment Systems, EPA 600/R-02/099, December.

EPA, 2001, Geosynthetic Clay Liners Used in Municipal Solid Waste Landfills, EPA 530-F-097-002, Revised December.

EPA, 1996, EPA Liner Study – Report to Congress, Section 4113(a) of the Oil Pollution Act of 1990, OSWER 9380.0-24, and EPA 540/R95/041, May.

EPA, 1993, Report of Workshop on Geosynthetic Liners, EPA/600/R-93/171, August.

EPA, 1991, Seminar Publication: Design and Construction of RCRA/CERCLA Final Covers, EPA 625 4-91 025, May.

EPA, 1990, Technology Transfer: Seminars - Design and Construction of RCRA/CERCLA Final Covers.

EPA, 1989, Technical Guidance Document: Final Covers on Hazardous Waste Landfills and Surface Impoundments, EPA 530-SW-89-047, July.

EPA, 1988, Project Summary: Geosynthetic Design Guidance for Hazardous Waste Landfill Cells and Surface Impoundments, EPA 600/S2-87/097, February.

EPA, 1987, Geosynthetic Design Guidance for Hazardous Waste Landfill Cells and Surface Impoundments, EPA 600/2-87/097.

Work Plan

Alternative Area 2 Excavation Depths and Volumes

Introduction

EPA's October 12, 2012 letter to the West Lake Landfill Operable Unit 1 (OU-1) Respondents states that, during an early consultation with the National Remedy Review Board (NRRB), the NRRB indicated that the deeper radiological detections in borings WL-210 and WL-235 are unreliable. Consequently, EPA has asked that the volume of radiologically-impacted material (RIM) considered for possible excavation under the "complete rad removal" alternatives be revised to exclude deeper intervals in soil borings WL-210 and WL-235 in Area 2.

Evaluation of the soil sample analytical results and the downhole gamma logging data during preparation of the SFS indicated that soil containing radionuclides above the levels used to identify material to be included within the scope of the two "complete rad removal" alternatives was potentially present within a deeper depth interval beneath the southwestern portion of Area 2. Specifically, elevated gamma peaks were identified on the downhole gamma logs at depths of 47.5 feet (ft) below ground surface (bgs) in WL-210 and 22.5 ft bgs in WL-235; however, the Remedial Investigation (RI) [EMSI, 2000] states (on p. 97) that boring WL-210 was re-logged because during the first logging attempt, material was knocked into the hole and that the presence of this material may have been the cause of a small poorly defined peak at the bottom of this boring. The RI also states (again on p. 97) that the presence of a poorly defined peak at the bottom of WL-235 may also be the result of RIM at shallow depths having been knocked into this borehole during drilling or logging activities.

Although the RI raised possible questions about the representativeness of the downhole gamma logs for the deeper intervals of these two borings, a soil sample obtained from boring WL-210 detected the presence of total Thorium-230+232 at a depth of 40 ft bgs at a level (18.6 pCi/g) above the cleanup level (7.9 pCi/g) used to evaluate potential excavation alternatives A duplicate sample obtained from this same depth interval contained total thorium at 11.6 pCi/g. These samples were obtained from a depth of 40 ft, 10 feet above the bottom of the borehole. In addition, these samples were obtained during drilling of the borehole, prior to the downhole logging activities that may have resulted in surficial material being knocked into the hole. Therefore, these sample results likely represent actual conditions at the 40 ft depth interval in boring WL-210. The RI sampling did not include collection of a soil sample from the deeper portion of the WL-235.

Although uncertainty exists regarding the representativeness of the downhole gamma logs at these two locations, the soil sample result from the 40 ft depth in WL-210 combined with the downhole gamma logs were used to define an area and volume of a deeper interval of RIM occurrence beneath the southwestern portion of Area 2. This material and the associated overburden material that would need to be removed to allow for excavation of this RIM, were included within the overall volumes of materials that would need to be excavated if one of the "complete rad removal" alternatives were to be

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implemented at the site. (Note: Deeper intervals of radiologically-impacted material were also identified beneath other portions of Area 2 but are not the subject of this re-evaluation).

Because of the uncertainty associated with the downhole gamma logging at these two locations, EPA has indicated that the NRRB believes the radiological detections in the deeper portions of these two borings are unreliable. EPA has therefore requested that the volumes of materials that may be removed under a "complete rad removal" alternative be re-estimated to exclude the deeper depth intervals in borings WL-210 and WL-235.

Approach

The following approach will be used to develop a revised excavation volume for Area 2:

1. Revise the calculated volume of material to be excavated under the "complete rad removal" alternatives to eliminate deeper intervals in soil borings WL-210 and WL-235 and consequently to eliminate removal of the deeper interval of RIM material from the southwestern portion of Area 2; and

2. Develop revised estimates of the potential risks to workers and the public, revised projected construction schedules, and revised cost estimates for excavation and offsite or onsite disposal based on exclusion of the potential deeper occurrences of RIM beneath the southwestern portion of Area 2.

Deliverables

The following deliverables will be prepared pursuant to this task

1. Interim Deliverable – A brief memorandum will be prepared summarizing the revisions to the RIM extent and volumes resulting from exclusion of the deeper interval beneath the southwestern portion of Area 2. If the re-evaluation of the volume material results in significant changes in the amounts of materials that would be excavated under the "complete rad removal" alternatives, this memorandum will also include evaluations of potential risks, revised calculations of greenhouse gas emissions, revised anticipated project schedules, and revised anticipated costs for the two "complete rad removal" alternatives based on the assumption that the deeper intervals in borings WL-210 and WL-235 are not included in the volume of RIM material under the two "complete rad removal" alternatives.

2. SFS Revisions – The existing SFS text, tables and appendices will be amended to include the results of alternative development and evaluation based on exclusion of the deeper intervals in borings WL-210 and 235 in conjunction with the existing discussions that include these depth

intervals as presented in the current SFS report. Subject to EPA comments on the Interim Deliverable, the following specific revisions to the December 2011 SFS report are anticipated:

a. Amend the text of the SFS as follows:
    i. Section 5.3.1 – Include as part of the descriptions of the excavation and disposal alternatives the volumes of RIM and overburden material to be excavated if the reported deeper occurrences in borings WL-210 and WL-235 are not considered in addition to the total volumes already presented in this section
    ii. Sections 6.2.2 and 6.2 3 – Include as part of the descriptions of the excavation and disposal alternatives the volumes of RIM and overburden material to be excavated if the reported deeper occurrences in borings WL-210 and WL-235 are not considered in addition to the total volumes already presented in this section
    iii. Sections 6.2.2.5 and 6.2.3.5 – Add to the discussions of Short-Term Effectiveness, in particular the Protection of the Community, Protection of Workers, and Time Until RAOs are Achieved, discussions relative to the reduced volume of material and consequently reduced time frames that would be associated with excavation and disposal alternatives if the reported deeper occurrences in borings WL-210 and WL-235 are not considered
    iv. Sections 6.2.2.7 and 6.2.3.7 – Add to the discussion of Cost, the estimated costs to implement the excavation and disposal alternatives based on the reduced volume of material and consequently reduced time frames that would be associated with excavation and disposal alternatives if the reported deeper occurrences in borings WL-210 and WL-235 are not considered
    v. Sections 7.2.3 (Short Term Effectiveness) and 7.2.5 (Cost) – Revise the comparative analysis of alternatives to reflect the differences between the short-term risks, schedules and costs that result from inclusion or exclusion of the deeper intervals in borings WL-210 and WL-235

b. Amend the Appendices to the SFS as follows:
    i. Appendix B – Develop and include an alternative excavation plan that does not include excavation of the deeper intervals at WL-210 and WL-235 and calculate the revised volume of RIM and overburden material to be excavated.
    ii. Appendix H – Develop and include estimates of the potential risks to the community and workers based on the volumes of RIM and overburden material to be excavated and revised construction schedules if the deeper intervals in borings WL-210 and WL-235 are not considered
    iii. Appendix I – Prepare additional estimates of Greenhouse Gas Emissions associated with the "complete rad removal" alternatives under a scenario where the deeper intervals in borings WL-210 and WL-235 are not considered

iv Appendix J – Prepare additional construction schedules for the "complete rad removal" alternatives under a scenario where the deeper intervals in borings WL-210 and WL-235 are not considered

v. Appendix J – Prepare additional estimates of the construction costs (both fiscally constrained and not-fiscally constrained) for the "complete rad removal" alternatives under a scenario where the deeper intervals in borings WL-210 and WL-235 are not considered

Clarifications by EPA

No additional information or clarifications are being requested from EPA at this time relative to this task.

Anticipated Schedule

It is anticipated that it will take approximately two months to develop the interim summary memorandum.

Preparation of a Supplemental SFS report that includes the results of the revised Area 2 excavation volumes and associated evaluations, as described in the interim deliverable summary memorandum, will be performed once EPA comments on the interim deliverable are received and in conjunction with revisions to the existing SFS report required to address the results of the various other additional tasks EPA has requested.

References

Engineering Management Support, Inc. (EMSI), 2011, Supplemental Feasibility Study, Radiologically-Impacted Material Excavation Alternative Analysis, West Lake Landfill Operable Unit-1, December 16.

EMSI, 2000, Remedial Investigation, West Lake Landfill Operable Unit-1, April 10.